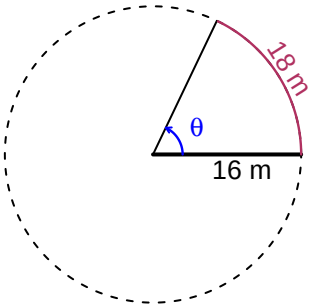
Name: Date:

# Trig Final (SLTN v625)

- You should have a calculator (like Desmos) and a unit-circle reference sheet.

### Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The radius is 16 meters. The arc length is 18 meters. What is the angle measure in radians?

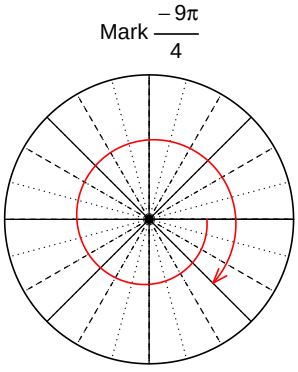


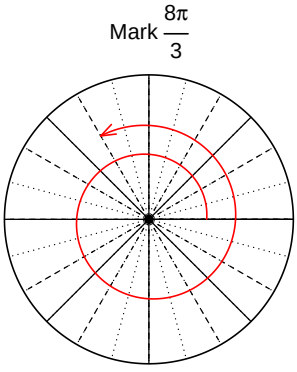

$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

$\theta = 1.125$ radians.

### Question 2

Consider angles $\frac{-9\pi}{4}$ and $\frac{8\pi}{3}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\cos\left(\frac{-9\pi}{4}\right)$ and $\sin\left(\frac{8\pi}{3}\right)$ by using a unit circle (provided separately).



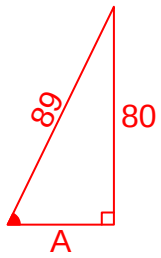

$\cos(-9\pi/4) = \frac{\sqrt{2}}{2}$

$\sin(8\pi/3) = \frac{\sqrt{3}}{2}$

**Question 3**

If $\sin(\theta) = \frac{80}{89}$, and $\theta$ is in quadrant II, determine an exact value for $\tan(\theta)$.

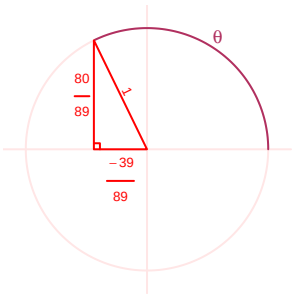
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.




Solve the Pythagorean Equation

$$A^2 + 80^2 = 89^2$$
$$A = \sqrt{89^2 - 80^2}$$
$$A = 39$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant II in a unit circle.




$$\tan(\theta) = \frac{\frac{80}{89}}{\frac{-39}{89}} = \frac{-80}{39}$$

**Question 4**

A mass-spring system oscillates vertically with an amplitude of 8.5 meters, a frequency of 2.28 Hz, and a midline at $y = -6.09$ meters. At $t = 0$, the mass is at the midline and moving down. Write an equation to model the height ($y$ in meters) as a function of time ($t$ in seconds).

Any of these equations would get full credit.

$$y = -8.5\sin(2\pi 2.28t) - 6.09$$

or

$$y = -8.5\sin(4.56\pi t) - 6.09$$

or

$$y = -8.5\sin(14.33t) - 6.09$$